13. Sarner M, Wilson RJ: Erythema nodosum and psittacosis: Report of five cases. Br Med J 1965; 2:1469-1470

14. Cornog JL, Hanson CW: Psittacosis as a cause of miliary infiltrates of the lung and hepatic granulomas. Am Rev Respir Dis 1968; 98:1033-1036

15. Sutton GC, Morrissey RA, Tobin JR, et al: Pericardial and myocardial disease associated with serological evidence of infection by agents of the psittacosis-lymphogranuloma venereum group (Chlamydiaceae). Circulation 1967; 36:830-838

16. Dymock IW, Lawson JM, MacLennan WJ, et al: Myocarditis associated with psittacosis. Br J Clin Pract 1971; 25:240-242

17. Sullivan P, Brewin A: Evidence of skeletal muscle involvement in psittacosis. West J Med 1974; 121:232-234

18. Carr-Locke DL, Mair HJ: Neurological presentation of psittacosis during a small outbreak in Leicestershire. Br Med J 1976; 2:853-854

19. Geddes DM, Skeates SJ: Ornithosis pneumonia associated with haemolysis. Br J Dis Chest 1977; 71:135-137

20. Kundu CR, Scott ME: Pericardial effusion complicating psittacosis infection. Br Heart J 1979; 42:603-605

21. Byrom NP, Walls J, Mair HJ: Fulminant psittacosis. Lancet 1979; 1:353-356

22. Covelli HD, Husky DL, Dolphin RE: Psittacosis. West J Med 1980; 132:242-245

23. Bhopal RS, Thomas GO: Psittacosis presenting with Reiter's syndrome. Br Med J 1982; 284:1606

24. Lanham JG, Doyle DV: Reactive arthritis following psittacosis. Br J Rheumatol 1984; 23:225-226

25. Johnson FNA, Matheson BA, Williams H, et al: Abortion due to infection with *Chlamlydia psittaci* in a sheep farmer's wife. Br Med J 1985; 290:592-594

26. Levison DA, Guthrie W, Ward C, et al: Infective endocarditis as part of psittacosis. Lancet 1971; 2:844-847

27. Birkhead JS, Apostolov K: Endocarditis caused by a psittacosis agent. Br Heart J 1974; 36:728-731

28. Ward C, Sagar HJ, Cooper D, et al: Insidious endocarditis caused by *Chlamydia psittaci*. Br Med J 1975; 4:734-735

29. Dick DC, McGregor CGA, Mitchell KG, et al: Endocarditis as a manifestation of Chlamydia B infection (psittacosis). Br Heart J 1977; 39:914-916

30. Jariwalla AG, Davies BH, White J: Infective endocarditis complicating psittacosis: Response to rifampicin. Br Med J 1980; 280:155

31. Bromage D, Jeffries DJ, Philip G: Embolic phenomena in chlamydial infection. J Infect 1980; 2:151-159

32. Jones RB, Priest JB, Kuo C: Subacute chlamydial endocarditis. JAMA 1982; 247:655-658

33. Porter ME, Kaufmann AK, Plikaytis BD: Psittacosis in the United States, 1979. MMWR CDC Surveill Summ 1983; 32:27SS-31SS

34. Olson BJ, Treuling WL: An epidemic of severe pneumonitis in the bayou region of Louisiana—I. Epidemiological study. Public Health Rep 1944; 59:1299-1311

35. Psittacosis of non-avian origin. Lancet 1984; 2:442-443

36. Meyer KF, Eddie B: Human carrier of the psittacosis virus. J Infect Dis 1951; 88:109-125

37. Meyer KF, Eddie B: The influence of tetracycline compounds on the development of antibodies in psittacosis. Am Rev Tuber 1956; 74:566-571

38. Isaacs D: Psittacosis (Editorial). Br Med J 1984; 289:510-511

39. Schachter J, Sugg N, Sung M: Psittacosis: The reservoir persists. J Infect Dis 1978; 137:44-49

40. Hollen CR, Altus P: Psittacosis pneumonia: An unusual therapeutic response. South Med J 1982; 75:236-237

41. Davis AM, Helms CM, Mitros FA, et al: Severe hepatic damage after acetaminophen use in psittacosis. Am J Med 1983; 74:349-352

Nine Episodes of Infective Endocarditis in One Patient—A New Record

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INFECTIVE ENDOCARDITIS is a frequent complication of intravenous drug abuse, and recurrence is common if parenteral drug abuse continues.[1-3] Right-sided endocarditis in drug abusers has a mortality rate of 5% to 15%, while the mortality for each episode of left-sided endocarditis is 24% to 64%.[3-5] The likelihood of surviving several episodes of left-sided bacterial endocarditis is therefore small, and previous publications have reported no more than six episodes in a single patient.[6] We report the case of a patient who has survived nine documented episodes of mitral valve infective endocarditis over a 12-year period, including two episodes of fungal endocarditis and two mitral valve replacements.

Report of a Case

The patient is a 34-year-old man with a history of intravenous drug abuse since 1967. His first episode of mitral valve endocarditis was diagnosed in October 1972, when he came to San Francisco General Hospital Medical Center (SFGHMC) with fever and a murmur of mitral regurgitation. Multiple cultures of blood specimens grew group D *Streptococcus*. The patient was treated with a regimen of penicillin G and streptomycin sulfate given intravenously for 30 days and recovered without complication. He continued to use intravenous drugs and had eight subsequent episodes of endocarditis over the next 12 years (Table 1), all treated at SFGHMC. At least four of these episodes were complicated by congestive heart failure. Two episodes (numbers 5 and 6) were caused by persistent *Candida* infection complicated by bacterial superinfection. There was never any evidence of right-sided valve infection. In 1978 he underwent mitral valve replacement for persistent fungal endocarditis, and the two subsequent bacterial infections were cured medically, despite this prosthesis. In July 1984 he was diagnosed as having combined bacterial and fungal endocarditis and was given another mitral valve replacement (despite objections from some consultants) in conjunction with antimicrobial therapy. During the operation he was found to have abscesses in the mitral annulus. At last follow-up (November 1986), the patient was mildly disabled and receiving medical therapy for New York Heart Association class II congestive heart failure. He had no signs of infection and said he had discontinued intravenous drug use. Blood specimens drawn in November 1986 and cultured for bacterial and fungal pathogens were sterile.

Discussion

Recurrent infective endocarditis has been defined as a new intracardiac infection developing either more than six months after cure of an initial infection, regardless of pathogen, or by infection with a new organism regardless of time elapsed.[3,7] The remarkable case of the patient reported here met the first criterion in episodes 3 and 7, the second in episodes 4 and 5 and both criteria in episodes 2, 6, 8 and 9 (Table 1).

Recurrences of infective endocarditis are common in parenteral drug abusers. One study found that second episodes occurred in 17% to 24% of patients, and 5% had third episodes within a mean follow-up time of 20 months.[5] These rates are much higher than the 4% to 8% reinfection rate seen in the nonaddict population.[7] In 1979 Mokotoff and co-

workers reported the case of a drug abuser who had six episodes of left-sided bacterial endocarditis and an aortic valve replacement; the patient died during the sixth infection.[6] In reviews of published studies and discussions with authorities in this field, we have learned of no more than six episodes of infective endocarditis occurring in a single patient.[6]

Mortality figures for the first occurrence of right-sided infective endocarditis range from 5% to 15% and for left-sided infection from 24% to 64%.[3-5] Welton and colleagues found that if debilitated patients were excluded from a study of patients with one or two recurrences—that is, two to three total episodes—of either right- or left-sided infective endocarditis, the mortality increased from 9% with the initial episode to 25% for subsequent episodes.[3] Disease in the left side of the heart was present in 85% of those who died of recurrent endocarditis and the mortality for recurrent left-sided endocarditis was 35%.[3] Hubbell and associates found a mortality range of 24% to 33% with mitral valve endocarditis and a mortality of 33% with second or third episodes of endocarditis.[5] The presence of heart failure greatly increases the risk of death from endocarditis.[2,3,5,8] In one study, the one-year mortality of patients with endocarditis complicated by mitral insufficiency and severe heart failure was 80%, whereas in patients with endocarditis complicated by mitral insufficiency but with absent or mild heart failure, the one-year mortality was 20%.[8] In fungal endocarditis the mortality approaches 80% despite aggressive management with a combination of antifungal agents, surgical debridement and valve replacement.[9-11] Therefore, the calculated likelihood of this patient surviving the infections and procedures documented in Table 1 is between 0.05% and 0.5%, a remarkable tribute to his physical resilience.

Beneath the extreme statistics of this case lie a number of troublesome ethical and economic issues. A study of survivors of valve replacement for endocarditis found that in all three patients with a history of intravenous drug abuse, recurrent infection developed on the prosthesis, versus none of eight patients who lacked a history of intravenous drug abuse ($P = .006$).[3] Hubbell and co-workers described the cases of 25 intravenous drug abusers who had received prosthetic valve replacement for endocarditis. In this group, second infections developed in 24% and only 32% lived beyond the mean of 16 months' follow-up.[5] The high rate of failure caused by recurrent infection in patients who are intravenous drug abusers makes valve replacement in these patients of dubious long-term value.

The patient reported here has been in hospital for more than one full year out of the past twelve for treatment of endocarditis; this figure does not include known hospital admissions for other problems largely related to drug abuse. Today the average daily cost for an inpatient stay at SFGHMC is more than $500; the cost of mitral valve replacement is about $20,000. At today's prices we estimate that this patient has received almost a quarter of a million dollars of health care. In the past our society has not placed fiscal or other restraints on the availability of health care to persons with

TABLE 1.—*Microbiologic Features of Episodes of Endocarditis*

Episode, Number	*Date of Presentation*	*Infective Organism*	*Treatment*	*Length of Hospital Stay, Days*
1	October 1972	Group D streptococci	Penicillin G, streptomycin sulfate	30
2	January 1976	Viridans streptococcus; antimicrobial resistance—none*	Ampicillin, streptomycin sulfate	33
3	Nov 10, 1976	Viridans streptococcus; antimicrobial resistance—methicillin, tetracycline, kanamycin*	Penicillin G, gentamicin sulfate	10†
4	Nov 25, 1976	*Candida parapsilosis*	Amphotericin B	82
5	May 1977	*Staphylococcus aureus* *Candida parapsilosis*	Methicillin sodium, rifampin, amphotericin B	73
6	December 1977	Viridans streptococcus, *Candida parapsilosis*	Penicillin G, streptomycin sulfate, rifampin, amphotericin B, mitral valve replacement	64
7	May 1980	Viridans streptococcus	Penicillin G, streptomycin sulfate	13†
8	September 1982	*Streptococcus faecalis*	Penicillin G, streptomycin sulfate	41
9	July 1984	Viridans streptococcus, *Candida parapsilosis*	Penicillin G, nafcillin sodium, gentamicin sulfate, ketoconazole, amphotericin B, mitral valve replacement	29
			Total Hospital Days	375

*Tested by disc diffusion.
†Left hospital against medical advice.

problems of recurrent self-abuse. Given the increasing sophistication and cost of medical technology and the decreasing resources available for medical care, it is not clear that this attitude of infinite charity can be supported in the future.

REFERENCES

1. Garvey GJ, Neu HC: Infective endocarditis. Postgrad Med 1975; 58:107-113

2. Cherubin CE, Neu HC: Infective endocarditis at the Presbyterian Hospital in New York City from 1938-1967. Am J Med 1971; 51:83-96

3. Welton DE, Young JB, Gentry LO, et al: Recurrent infective endocarditis: Analysis of predisposing factors and clinical features. Am J Med 1979; 66:932-938

4. Richardson JV, Karp RB, Kirklin JW, et al: Treatment of infective endocarditis: A 10-year comparative analysis. Circulation 1978; 58:589-599

5. Hubbell G, Cheitlin MD, Rapaport E: Presentation, management, and follow-up evaluation of infective endocarditis in drug addicts. Am Heart J 1981; 102:85-94

6. Mokotoff D, Young JB, Welton DE, et al: Recurrent infective endocarditis in a drug addict. Chest 1979; 76:592-594

7. Levison ME, Kaye D, Mandell GL, et al: Characteristics of patients with multiple episodes of bacterial endocarditis. JAMA 1970; 211:1355-1357

8. Mills J, Utley J, Abbott J: Heart failure in infective endocarditis: Predisposing factors, course, and treatment. Chest 1974; 66:151-157

9. Seelig MS, Kozinin PJ, Goldberg P, et al: Fungal endocarditis: Patients at risk and their treatment. Postgrad Med J 1979; 55:632-641

10. Rubinstein E, Noriega ER, Simberkoff MS, et al: Fungal endocarditis: Analysis of 24 cases and review of the literature. Medicine (Baltimore) 1975; 54:331-344

11. Turnier E, Kay JH, Bernstein S, et al: Surgical treatment of candida endocarditis. Chest 1975; 67:262-268